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MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole # 20-09-11

Borehole Information

Farm : B	**Tank :** B-109	**Site Number :** 299-E33-200
N-Coord : 45,472	**W-Coord :** 52,775	**TOC Elevation :** 651.84
Water Level, ft :	**Date Drilled :** 1/31/1972	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 100	

Borehole Notes:

Borehole 20-09-11 was drilled in January 1972 to a depth of 100 ft and was completed with 6-in. casing. Data from the drilling log and Chamness and Merz (1993) were used to provide borehole construction information. These references do not indicate that the borehole casing was perforated or grouted. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel tubing.

Equipment Information

Logging System : 1B	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 02/1997	**Calibration Reference :** GJO-HAN-14	**Logging Procedure :** P-GJPO-1783

Logging Information

Log Run Number :	1	**Log Run Date :**	09/17/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	100.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	45.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	09/18/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	46.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	7.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	3	**Log Run Date :**	09/18/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	7.0	**Counting Time, sec.:**	100	**L/R :** R	**Shield :** N
Finish Depth, ft. :	5.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	4	**Log Run Date :**	09/18/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	5.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	0.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	5	**Log Run Date :**	09/18/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	8.5	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	28.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged by the SGLS in five log runs. Because of a high count-rate zone near the ground surface, the interval from 5.5 to 7 ft was logged as a separate log run in real time. The remainder of the borehole was logged in live time. The fifth logging run was performed as an additional log data quality check and to demonstrate the repeatability of the data acquisition system.

The top of the borehole casing, which is the zero reference for the SGLS, is approximately 6 in. above the ground surface. The total logging depth achieved using the SGLS was 100.0 ft. The logging engineer observed the borehole is located within about 5 ft of a cover block. Below the cover block is a network of valves and piping that exit the tank. The engineer believed piping may be exiting this area undergound and could pass near enough to the borehole to be detected by the logging instrumentation.

Analysis Information

Analyst : P.D. Henwood

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 03/22/1999

Analysis Notes :

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the accepted calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

A casing correction factor for a 0.280-in.-thick steel casing was applied to the concentration data during the analysis process.

Shape factor analysis was applied to the SGLS data and provides insights into the distribution of Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots indicate the MDL. The MDL of a

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radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A plot of the rerun section is included to compare the repeatability of the logging system between two separate log runs.

A plot of the shape factor analysis results is included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

Results/Interpretations:

The man-made radionuclide Cs-137 was the only contaminant detected around this borehole. The Cs-137 contamination was detected continuously from the ground surface to a depth of about 11.5 ft, at a few locations between 16.5 and 18.5 ft, and at 73.5 ft. The maximum Cs-137 concentration was 2,057 pCi/g measured at a depth of 6.5 ft. The Cs-137 concentrations detected below 10 ft were all less than 1 pCi/g.

Shape factor results indicate a remote source of Cs-137 contamination at about 6.5 ft that may be a contaminated pipeline. Logging engineers on site also postulated that a pipeline could exist in the immediate vicinity of the borehole.

The K-40 concentrations increase at about 39 ft, representing the transition from the backfill material to the undisturbed Hanford formation sediments.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank B-109.